DOUGLAS FERTILIZER in Humboldt

Photos show typical timber stands in Douglas-fir fertilization studies, Humboldt County.

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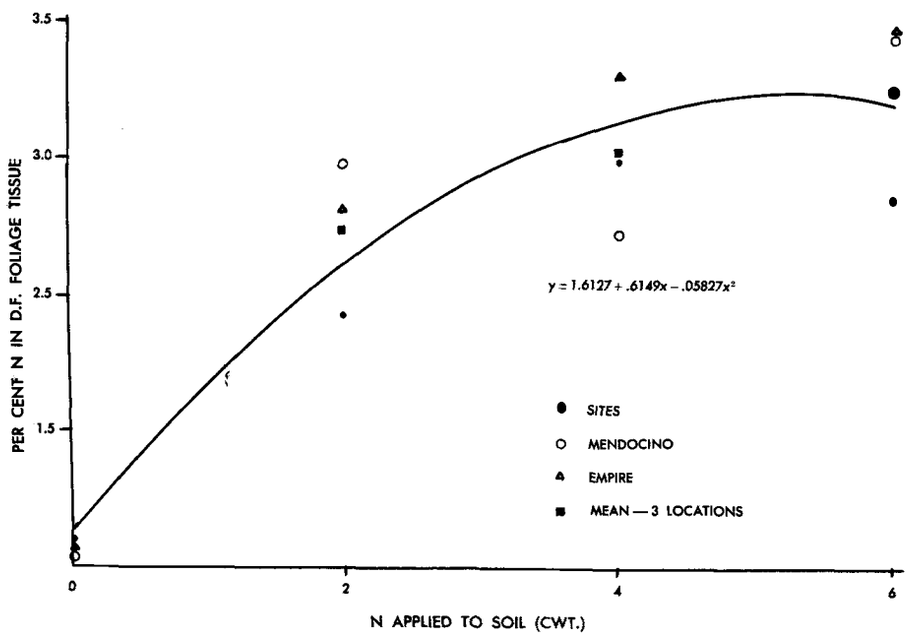
TENS OF THOUSANDS of acres of young Douglas-fir trees grow on good soils in Humboldt County. Most areas developed on previously logged areas and are between 5 and 25 years of age. Growth rates and stocking in these stands is generally good. Age class distribution on private land in the county is considerably out of balance, however, and faster growth in some areas would help maintain a steady supply of marketable size trees for forest products raw materials. The possibility of nitrogen fertilizer raising the rate of production for a long enough period to yield a satisfactory return on the investment, would give forest owners a very important tool.

Trials were established in the spring of 1969 with the objective of determining the response of Douglas-fir in height and diameter growth, to different levels of nitrogen. Foliar analysis was made to relate foliar N level with growth response so an index to expected results on North Coast soils could be developed. Three locations were selected on soil series which, through previous foliar sampling, had shown a trend toward low average N levels. At each of the locations, three blocks were established. Each block contained four plots of 1/10 or 1/20 acre. Ammonium nitrate was broadcast by hand at rates of 200, 400, and 600 lbs of N per acre on plots in each block and one plot was left untreated as a control.

Five trees judged to be "crop" trees were selected on each plot for measurement. Tree height and diameter at time of N application were recorded, and were remeasured following the 1969 growing season. Foliar samples were collected at the time of remeasurement. Foliage samples submitted for analysis were obtained by removing all of the needles from the southern-most branch on the top current year's branch whorl. Needles from five such branches on each plot were included in the sample. Soils selected for study included Sites, Mendocino, and Empire series.

Application of nitrogen fertilizer increased the percentage of nitrogen in Douglas-fir foliage. The level of phosphorus in the same foliage samples dropped. This response to nitrogen was similar at all three locations. A simple second degree curve, with equation (graph 1), describes the foliage response to nitrogen. Phosphorus response was different from that of nitrogen. The average phosphorus level at the three locations was not significantly different but there was a significant interaction between treatment and location. The pat-

GRAPH 1. N CONTENT OF DOUGLAS FIR FOLIAGE AS RELATED TO CWT OF N APPLIED



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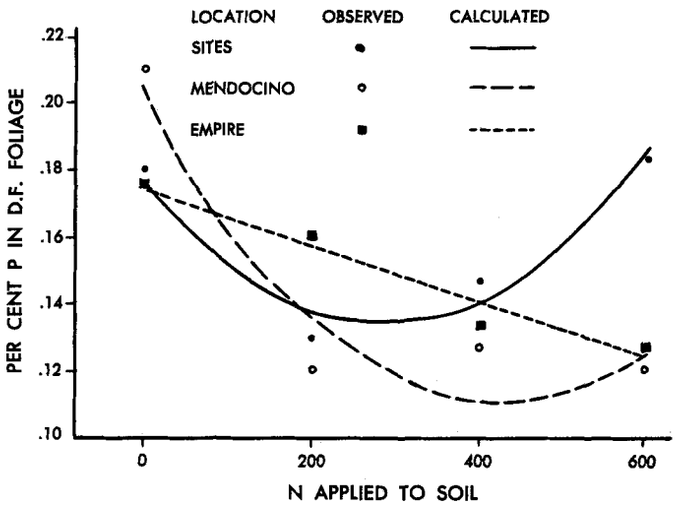
GRAPH 2. RESPONSE OF P CONTENT IN DOUGLAS FIR FOLIAGE TO NITROGEN APPLICATION



tern of phosphorus response to nitrogen applications differed from one location to another.

At the Sites soil location, the average phosphorus levels were essentially equal at the 0 and 600-lb nitrogen rates; they were considerably lower at the two middle rates of N. On Mendocino soil, P decreased abruptly from 0 to the 200-lb nitrogen rate, but from there on there was virtually no change in level of P. On Empire soil, P decreased steadily throughout the entire range of nitrogen additions. Graph 2 illustrates the different responses at the plot locations on the three soils.

Analysis of increase in diameter from 1969 to 1970 showed a significant increase in growth on plots to which nitrogen had been added (see table). This response showed a significant linear component and a highly significant quadratic component. The response rose quite sharply at the 200-lb and 400-lb nitrogen levels then fell off at the 600-lb level. The response in different locations varied significantly. Average growth diameter was increased 48% by 200 lbs of N. Six hundred pounds of N resulted in an increase of 32%. At 200 pounds, trees on Sites soil showed a 67% increase; Mendocino soil 37%; and Empire soil 44%.

The addition of nitrogen also caused a significant increase in height growth (see table). This increase showed the same kind of significant quadratic response as was observed with diameter.

The magnitude of the first year growth response of Douglas-fir to nitrogen fertilization was encouraging, particularly at the lower levels used in these trials. Continued remeasurement will be required to evaluate the longevity of the response. During the spring of 1970, additional plots were established using 50, 100, 150, and 200-lb rates of N. The results of these trials will be reported as they become available. Whether additions of fertilizer can be economically applied to young stands to bring them to maturity in a shorter period of time still remains to be determined.

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FIRST YEAR HEIGHT AND DIAMETER INCREMENT OF DOUGLAS-FIR TREATED WITH VARIOUS LEVELS OF NITROGEN

Treatment	1969 diameter	1969 diameter increase	1969 height	1969 height increase
lbs per acre	inches	inches	ft	ft
Sites soil				
Control	1.67	.24	12.59	2.78
200	1.68	.40	12.36	3.27
400	1.76	.33	13.25	2.86
600	1.57	.32	12.55	3.08
Mendocino soil				
Control	1.29	.34	10.45	2.37
200	.90	.46	8.84	2.74
400	.85	.45	8.44	2.79
600	.98	.43	9.54	2.51
Empire soil				
Control	1.67	.34	12.85	2.51
200	1.87	.50	13.29	3.26
400	1.64	.58	12.42	3.32
600	1.84	.48	13.63	3.21
All locations				
Control	1.54	.31	11.96	2.55
200	1.48	.46	11.50	3.09
400	1.41	.45	11.37	2.99
600	1.46	.41	11.90	2.94